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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/625,919	07/24/2003	Xiaohui Wang	86326WFN	9493

7590 10/19/2006	**EXAMINER**
Thomas H. Close	KUHN, JORDAN M
Patent Legal Staff	

Thomas H. Close
Patent Legal Staff
Eastman Kodak Company
343 State Street
Rochester, NY 14650-2201

ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/625,919	WANG ET AL.
	Examiner	Art Unit
	Jordan Kuhn	2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 July 2003*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 4-9* is/are rejected.

7)☒ Claim(s) *3 and 10* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date *7/24/03, 9/16/05*.

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____ .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2.   Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6 recites, "determining whether the ratio between the background region exceeds a certain threshold". However, a ratio must be determined between two things. This ratio is between the background region and what else? The examiner will interpret this claim in view of the specification which discloses "because the anatomy should be of a minimum size when background exits, the ratio between the background area and all the non-foreground area should not exceed a certain threshold", at page 14 lines 4-6.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4.   Claims 1-2, and 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang (US Patent No 6,775,399) in view of Dewaele (EP 1256907).

Regarding **claim 1**, Jiang discloses a method for region of interest segmentation in medical images comprising acquiring a digital CR image, as disclosed at column 4, lines 34-42, which reads on "acquiring a digital radiographic image including a matrix of rows and columns of pixels", generating a histogram of the image and extracting a point on the histogram corresponding with the valley that separates the background of the image from a region of interest in the image, wherein the point is then adjusted and used as a threshold, as disclosed at column 1 lines 32-45, which reads on "detecting the initial background left point of a histogram of said image", further comprising detecting the foreground (collimated regions) of the image, as disclosed at column 5 line 60 – column 6 line 20, which reads on "detecting the foreground of said image", further comprising extracting the background (direct exposure region) from the image, validating the extracted foreground and the extracted background, generating a mask that combines the extracted foreground and the extracted background, and using the mask to extract the region of interest from the image, as disclosed at column 6 lines 21-53 and at column 11 line 61 – column 12 line17, which reads on "validating the background of said image; merging the background and foreground regions of said image as diagnostically irrelevant regions; and extracting the anatomy region of said image as the diagnostically relevant region". However, Jiang fails to specifically disclose regenerating the background of the image by region growing. However, the examiner maintains that it was well known in the art to provide for regenerating a background of an image by region growing, as taught by Dewaele.

In the same field of endeavor, Dewaele discloses a method for segmenting a medical image comprising extracting a background region (direct exposure area) from an image by using a seed fill algorithm that starts from background (seed) pixels at the border between the

background region and the foreground (collimation) region, as disclosed at paragraphs 39 and

59, which reads on "regenerating the background of said image by region growing".

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made, to modify Jiang, by providing for regenerating and extracting the

background of the image by a method of region growing, as taught by Dewaele, for the purpose

of increasing the accuracy of the segmentation.

Regarding **claim 2**, Jiang and Dewaele disclose everything as applied above (see claim

1). Jiang further discloses where the image is captured by a CR imaging apparatus, as disclosed

at column 4 lines 34-51 and at column 5 lines 41-59, which reads on "wherein said acquiring a

digital radiographic image includes acquiring a digital radiographic image from one of the

following: a diagnostic imaging device, a direct digital radiography or computer radiography

device, and x-ray film digitizer, a digital radiographic image archive".

Regarding **claim 5**, Jiang and Dewaele disclose everything as applied above (see claim

1). Dewaele discloses as discussed above, where the background region is extracted using a seed

fill algorithm wherein the seed points are a set of known background pixels, which reads on

"wherein said regenerating the background uses the region growing method from a set of known

"seed" background pixels".

Regarding **claim 6**, Jiang and Dewaele disclose everything as applied above (see claim

1). Jiang further discloses verifying the extracted foreground region of the image by comparing

the ratio of the foreground region to the area of the entire image, and also by comparing intensity

distributions to a threshold, as disclosed at column 10 lines 32-48, wherein it would be extremely

obvious to use similar methods in the background validation step discussed in claim 1, which

reads on "wherein said validating said background includes determining whether the ratio between the background region exceeds a certain threshold and whether the dynamic range of all the non-foreground region is greater than a minimum threshold and if one or both are not then the background detected is invalid".

Regarding **claim 7**, Jiang and Dewaele disclose everything as applied above (see claim 1). Jiang further discloses locating holes outside of the region of interest (including gaps between the extracted foreground and background) and filling them in with background mask pixel values, as disclosed at column 11 lines 53-59, which reads on "wherein said merging the background and foreground regions of said image includes removing any transition gaps between said regions".

Regarding **claim 8**, Jiang and Dewaele disclose everything as applied above (see claim 1). Jiang further discloses using a combined foreground and background mask, which represent the extracted foreground and background regions in order to subtract the combined foreground/background region from the input image, as disclosed at column 12 lines 6-24, which reads on "wherein said extracting the anatomy region is carried out by subtracting the merged foreground and background regions from said acquired image".

Regarding **claim 9**, Jiang and Dewaele disclose everything as applied above (see claim 1). Jiang further discloses labeling the detected regions of interest, as disclosed at column 12 lines 4-6, which reads on "wherein extracting the anatomy region is followed by a refining process using image labeling to identify a plurality of largest connected regions as the anatomy regions".

5.   Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang in view of

Dewaele further in view of Wang et al. (US Patent No 6,212,291), hereinafter referenced as

Wang.

Regarding **claim 4**, Jiang and Dewaele disclose everything as applied above (see claim

1). Although Jiang and Dewaele disclose extracting the foreground of the image, they fail to

specifically disclose the foreground extraction method recited in claim 4. However, the

examiner maintains that it was well known in the art to provide for extracting the foreground of

an image by: providing as inputs an acquired digital radiographic image and an initial

background left point, using a smart edge detection process to classify all significant transitions

in the image, conducting a Hough Transform to delineate all the lines that are possible

collimation blades, finding candidate partition blade pairs if said image has several radiation

fields, lining a divide-and-conquer process to partition said image into sub-images containing

only one radiation field, and identifying the best collimation for each sub-image to detect the

foreground, as taught by Wang.

In the same field of endeavor, Wang discloses providing as inputs an acquired digital

radiographic image and an initial background left point, using a smart edge detection process to

classify all significant transitions in the image, conducting a Hough Transform to delineate all

the lines that are possible collimation blades, finding candidate partition blade pairs if said image

has several radiation fields, lining a divide-and-conquer process to partition said image into sub-

images containing only one radiation field, and identifying the best collimation for each sub-

image to detect the foreground, as disclosed at column 4 line 39 – column 5 line 10, which reads

on "providing as inputs said acquired digital radiographic image and said initial background left

point; using a smart edge detection process to classify all significant transitions in said image; conducting a Hough Transform to delineate all the lines that are possible collimation blades; finding candidate partition blade pairs if said image has several radiation fields; lining a divide-and-conquer process to partition said image into sub-images containing only one radiation field; and identifying the best collimation for each sub-image to detect the foreground".

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to modify Jiang and Dewaele, by providing for providing as inputs an acquired digital radiographic image and an initial background left point, using a smart edge detection process to classify all significant transitions in the image, conducting a Hough Transform to delineate all the lines that are possible collimation blades, finding candidate partition blade pairs if said image has several radiation fields, lining a divide-and-conquer process to partition said image into sub-images containing only one radiation field, and identifying the best collimation for each sub-image to detect the foreground, as taught by Wang, for the purpose of improving the accuracy of the foreground detection algorithm.

Allowable Subject Matter

6.   Claims 3 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

7.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wang et al. ("Method for recognizing multiple radiation fields in computed radiography") disclose a method for detecting collimation regions in computed radiography images. Barski et al. ("New automatic tone scale method for computed radiography) disclose a method for extracting foreground, background, and a region of interest from a CR image. Senn et al. (US Patent No 5,889,882) disclose a method for detecting skin line transitions in medical images, using histograms, comprising determining length, range, high point, and maximum slope of the transitions. Barski et al. (US Patent No 5,606,587) disclose a method for detecting transitions between background and foreground in medical images, using histograms. Jang et al. (US Patent No 5,268,967) disclose a method for automatic foreground and background detection in radiographic images. Jang et al. (US Patent No 5,862,249) disclose a method for determination of positional orientation of radiographic images.

        Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jordan Kuhn whose telephone number is 571-272-4295. The examiner can normally be reached on M-F 8:00AM-4:30PM.

        If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on 571-272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

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system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

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like assistance from a USPTO Customer Service Representative or access to the automated

information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jordan Kuhn
Examiner
Art Unit 2624

BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600